the effects of surface tension, effects which are more simply shown in the contracting films, and tears of wine of the laboratory and dinner-party. It is well known that surface tension is capable of producing important and curious changes in the form of fluids, and will induce well-defined movements of a streaming character; surface tension, and the movements resulting from it, are modified and influenced by heat and electricity, and many biologists have suggested that surface tension may play an important part in producing amœboid movement. Prof. Bütschli takes many steps in advance of this; for having formed his artificial emulsion, he sees in all living protoplasm nothing but a similarly constructed emulsion, and concludes that because it is so similar its movements must be of the same nature. We feel in reading his work that not only does he in his enthusiasm twist the appearances of protoplasm to suit his own especial view of what its structure must be, but he is guilty of want of logical treatment of his premises when he has got them. Frommann, Hertzmann, Klein, and, indeed, most histologists regard protoplasm as consisting of a network of less fluid material, the interstices of which network are filled with a more fluid material, and this structure has been demonstrated in almost every animal cell. This view of the nature of protoplasm is open, however, we think, to criticism, for histologists are in the habit of preserving and hardening their tissues in fluids such as alcohol, picric acid, corrosive sublimate, which act as precipitants to protoplasm, and they blindly conclude that what they see in these preparations are present in the living cells. On this account many have questioned whether these networks are ever present in the living cells, and Berthold and Bütschli view living protoplasm as an emulsion of two fluids, one forming an alveolar honeycomb, the other filling its cavities. This honeycombed structure—emulsion—Bütschli finds everywhere, from the protoplasm of the protozoa to that of the higher vertebrates; where there was once a network now there is an emulsion. The interfibular substance of muscle mistaken by a few observers for a network is, for Bütschli, a honeycomb with frequent transverse partitions, and the fibrillated axis cylinder of a nerve has cross strands indicating that this is a honeycomb too. In the apparently structureless protoplasm of the outer part of an amœboid cell, such as is figured by Schäfer in the last edition of "Quain's Anatomy," this structure is present to Bütschli, and as he cannot see it there, even with the eye of faith, it is believed to be too delicate and the meshes too finely drawn out to be seen.

As to the chemical nature of protoplasm, about which most biologists who have had anything of a chemical training feel themselves rather in the dark, Prof. Bütschli has fairly definite views, and these it must be admitted fit in admirably with the emulsion theory. The honeycomb he regards with Reinke as a nucleo-albumen, containing some molecules of a fatty acid, and not miscible with water; the more fluid portion of protoplasm, filling the interstices of the honeycomb, he regards as a watery fluid containing albumen and an alkali free or combined with it.

Holding the above views concerning the structure of protoplasm, which indeed, according to Bütschli, resembles both in minute anatomical structure and chemical and physical properties the microscopic froth which he can manufacture, he looks upon the cause of the movements of the froth as the cause of the movements of the amœba, and also in all probability of striped muscle itself. Let Prof. Bütschli speak for himself:—

"Die Bewegung einfacher Amöben, wie A. guttula, limax, A. blattæ, Pelomyxa, ist den früher beschriebenen strömenden Oelseifenschaumtropfen so ungemein ähnlich, ja in allen wichtigen Punkten, so ganz ihr Ebenbild, dass ich von der Uebereinstimmung der wirksamen Kräfte in beiden Fällen vollkommen überzeugt bin" (page 198, see also pages 200 and 208.)

Now, for some time past it has been held that surface tension plays a part both in the streaming movements of protoplasm and in the production of amœboid movement, but no one has pushed this idea to the extent that Bütschli has done. Let us see if the facts of the case justify him in so doing. It is true that the picture of the moving foam and of the moving protoplasmic mass present many points of similarity to the eye of the observer, but what of that? The waxwork figure may deceive us all into imagining that it is a man, but once we know what it is the most ignorant of us would hardly venture to argue from its mechanism to our own. So when we look at Bütschli's foam particles, and when we are told that they do not consist of protoplasm, and merely of rancid olive oil and a weak carbonate of potash, then we may exclaim at their interest and novelty, but we shall not seriously compare them with living protoplasm. Science is passing through two phases—the first spiritualistic, the second mechanical. Psychology is still very much in the first stage, and physiology in the second. There are still those among us to whom the circulation is a thing of tubes and force-pumps, and nothing more, and absorption a process that can be imitated by a parchment dialyzer. Fortunately, we are getting rapidly through these two stages, and are beginning to recognise that the force-pump and parchment paper have led us often into wrong conclusions. Studies in evolution have taught us that protoplasm, made up no doubt of elements of the inorganic world, is nevertheless a complex of these elements of unique character, and with properties distinct from everything that is not protoplasm. The oil emulsion may, to the eye of the observer, conduct itself in a way exactly similar to an amœba—which, by the way, it does not, its processes being club-shaped, and never pointed—but this does not indicate that amœboid movements are similar in their nature. With equal right would the to-day representative of Madame Tussaud urge, on the strength of their waxwork show, that human arms move by springs and clockwork. Not only do these foam particles tell us nothing about protoplasm, but for the investigation of questions of surface tension they are evidently ill fitted. They are toys for the physicist, not for the physiologist. We know that surface tension can well account both for changes in shape and flowing movements of fluids; it is only by experimenting on protoplasm itself that it will be possible to determine what part this agency plays in protoplasmic activity.

In Professor Bütschli's work the reader will find much valuable information as to the views held from time to time as to the structure of protoplasm; and the production of this monograph is a strong indication of the single-mindedness both of German scientific men and of German publishers. It is a large quarto volume of two hundred and thirty pages, well printed, and illustrated with six beautiful plates, and upon a subject which of necessity appeals to a very limited number of readers.

JOHN BERRY HAYCRAFT.

FINGER-PRINTS IN THE INDIAN ARMY.

IT may interest some of your readers to see the terms of the order by which the method of finger-prints for purposes of identification has now been introduced into the Indian Army. A copy of it, sent by Lieut.-Colonel Surgeon Hendley, of Jeypore, has just reached me.

Army Headquarters, Medical Division, Simla, August 25, 1893.

In continuation of this Office Circular, No. 5, dated January 16, 1891, it is requested that as a means of identification of recruits for the Native Army, examining medical officers will

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cause an impression in printer's ink of the ends of the first three fingers of the right hand of each recruit passed by them as fit for the service, to be made on the Nominal Roll opposite the name of the recruit; and in the case of the Army Hospital Corps, in the Verification Roll.

A specimen of the required impression is shown below.

By order.

(Signed) C. H. PEARSON, Surgeon-Major,
Secretary to the P.M.O., H.M.'s Forces in India.

[Here follows the specimen impression.]

I trust that the medical officers who will have to take these prints, understand the importance of using so little ink that the impression shall be *clear*, though its tint may be only brown and not black; also that when comparing two prints they will use a low power lens and four pointers, two for each print. I have lately been using a watchmaker's glass of two-inch focus, secured to the end of a long and counterpoised arm, which turns, not too easily, round the screw by which it is attached to its support. The lens can be brought into focus with great ease, and it remains steady when left alone. I use at least two pointers for each print. They are T-shaped; their long arms are six or seven inches long, they are roughly made of wood as thick as the thumb, so that they are purposely not over light. Each pointer stands on three supports, viz. on the point of a bent pin, whose headless body has been thrust into the end of the long arm of the T, and on the ends of two nails, or better on staples, one of which is driven under either end of the cross-arm. It is most easy to adjust the point of the bent pin upon any desired character in the finger-print. Both hands of the observer are thus left free to manipulate other pointers, when desired. The stationary pointers are a great help in steadying the eye while pursuing a step by step comparison between two finger-prints.

FRANCIS GALTON.

NOTES.

THE collected works of Jean Servais Stas, which it is proposed to publish as a mark of honour to his memory, form three quarto volumes of about 500 or 600 pages each. The first volume contains the memoirs and papers relating particularly to the determination of atomic weights; the second comprises notes, reports, and lectures; and the third, posthumous works, which especially refer to spectroscopic researches. The edition is under the direction of MM. Spring and Defaire, and it will probably be completed in about a year. The three volumes will be published simultaneously at the uniform price of thirty francs. Subscribers of twenty francs or more to the Stas memorial fund will each receive a copy of the work, and contributors of less than twenty francs may increase their contributions to that sum, and so become a recipient. The names of subscribers will be published in an appendix to the third volume. After the completion of publication, the balance of the fund will be used for the erection of a monument. Stas' scientific work is more than sufficient to perpetuate his name among men of science, and the monument which it is proposed to erect will make it "known to all people."

AT the second day's meeting of the Photographic Congress, the opening of which was noted in our last issue, Mr. Andrew Pringle read a paper on "The Present Position of Micro-Photography," and W. Weissenberger contributed one on "A Process of Photo-Mechanical Printing in Natural Colours." The president, Capt. Abney, read a paper dealing with "Exposure and Chemical Action," in which he showed that the sum of excessively small exposures is not equivalent to the same exposure given at one time, and further, that very feeble intensity of light fails to produce the calculated amount of chemical action. Capt. R. H. Hills followed with a description of the instruments employed and the results obtained during the recent solar eclipse. At the final meeting of the congress, on October 12, Dr. A. Miethe read a paper on "The Practical Testing of Photographic Objectives," and Dr. P. Rudolph one on "The Measure and Numeration of the Stops of Photographic Lenses."

A STATUE of Duhamel-Dumonceau was unveiled at Pithiviers, on October 1. The French Minister of Agriculture, who performed the ceremony, claimed that Dumonceau was the first to institute agricultural experiments in the field.

DR. H. MÖLLER has been appointed Professor of Botany in the University of Greifswald.

AT the meeting of the International Geodetic Association, recently held at Geneva, a Commission, composed of M. Tisserand, with Profs. Foerster and Schiaparelli, was appointed to draw up a programme of observations to be made permanently at a number of different places in order to elucidate the question of latitudinal variations. The association will hold its annual meeting in Austria next year.

THE *Lancet* says that the Apothecaries' Society are about to apply to the courts for powers to sell their Botanical Gardens at Chelsea, the money value of which has been fixed at about £30,000. The removal of this historic garden would be a source of keen regret to the many who have profited by the instruction conveyed by its means.

WE are informed that the fund raised for paying the costs of Dr. Wallis Budge in the recent action of Rassam *v.* Budge has been fully subscribed. The list of the contributors, which is too long to print in its entirety, includes the following names:—Miss H. M. Adair, the Duke of Argyll, K.G., K.T., Lord Armstrong, C.B., the Marquis of Bath, Walter Besant, Dr. C. Bezold, Rev. H. Blunt, E. A. Bond, C.B., the Earl Cadogan, K.G., the Earl of Carlisle, Somers Clarke, N. G. Clayton, Miss Clendinning, Alfred Cock, Messrs. Thos. Cook and Son, Sir John Evans, K.C.B., F.R.S., Sir W. H. Flower, K.C.B., F.R.S., C. Drury Fortnum, A. W. Franks, C.B., F.R.S., Right Hon. W. E. Gladstone, M.P., Rev. Canon Greenwell F.R.S., Major-General Sir F. Grenfell, G.C.M.G., K.C.B., H. Rider Haggard, Lawrence Harrison, Thomas Harrison, James Hilton, Thomas Hodgkin, Sir H. H. Howorth, K.C.I.E., M.P., F.R.S., Right Hon. Thomas Huxley, F.R.S., Sir Frederick Leighton, Bart., P.R.A., William Lethbridge, Rev. W. J. Loftie, Right Hon. Sir John Lubbock, Bart., M.P., F.R.S., Lady Meux, F. D. Mocatta, Walter Morrison, Sir Frank Mowatt, K.C.B., Sir Charles Nicholson, Bart., D.C.L., the Duke of Northumberland, K.G., F. G. Hilton Price, Hon. W. F. D. Smith, M.P., E. Maunde Thompson, C.B., Cecil Torr, Sir Reginald Welby, G.C.B., John White.

NEW and extensive electrical works were inaugurated at Blackpool at the end of last week. In the course of a speech made during the celebrations, Lord Kelvin expressed the opinion that municipal corporations were right to take into their hands everything calculated to further the general good of the borough. It seemed to him that the Government ought to take up the whole business of telegraphs and telephones, and it would not be an improper thing if the whole railway system of the country were placed under the same management.

AN International Congress on Aerial Navigation formed one of the series of congresses which have recently been held at Chicago. The papers read on that occasion are being published in the form of a supplement to the *American Engineer*, together with other information relating to aeronautical engineering. The new publication is given a distinctive title, *Aeronautics*, but whether it will be continued after the whole of

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